CLASSICAL BOUNDING VOLUME TECHNIQUES

In a virtual environment, detecting collision is very crucial so that realistic behaviour could be simulated. Some of the examples are balls bouncing after hitting hard surfaces, a vase broken into pieces after hitting the floor and even the act of the actor standing correctly on the floor. In most cases, they require real-time collision detection in order to provide real-time response to the users.

Real-time collision detection is a basic element for realistic interaction (Bergen 2004). Real-time collision detection usually employs efficient and fast collision detection technique that has the ability to report any collision as accurate as possible. Spending too much resource on collision handling may jeopardize the resulting frame rates. In some applications, we have a choice to trade speed over accuracy in order to achieve interactive frame rates. However, neglecting too much accuracy may result in unrealistic behaviour.

Bounding volume is one of the most widely used techniques to speed up collision detection. It is an adaptation of a basic polyhedron that is used to bound a three dimensional (3D) object. Different types of polyhedron were used like a box, a sphere and oriented rectangular box. Three most important considerations when choosing the right type of bounding volume are speed, tightness and BV generation. Simple bounding volume requires simpler collision testing and this in turns needs less computing time to complete the test. On the other hand, simple bounding volume sometimes creates large empty corners. Large empty corners (where objects are not tightly bound) may lead to false collision detection. It happens when two (or more) bounding volumes collided at these empty corners without actual collision on the objects involved.

This chapter will discuss on the classical bounding volume techniques:

- Bounding sphere
- Axis-aligned bounding box (AABB)
- Oriented bounding box (OBB), and
- Discrete oriented polytopes (k-Dops)